CLAIMS

1. A hard disc drive comprising:

a) an actuator pivot;

b) a spindle motor assembly comprising a stator with conductors, a rotor, a shaft, and a plurality of bearings;

c) a base plate; and

d) a monolithic body of phase change material substantially encapsulating said actuator pivot and said stator to the base plate.

2. The hard disc drive of claim 1 wherein the hard disc drive has a thickness between about 2 millimeters to about 6 millimeters.

3. The hard disc drive of claim 1 wherein the hard disc drive has a thickness of about 3.3 millimeters.

4. The hard disc drive of claim 1 wherein the hard disc drive has a thickness of about 2 millimeters.

5. The hard disc drive of claim 1 wherein the hard disc drive has a thickness of about 5 millimeters.

6. The hard disc drive of claim 1 wherein the hard disc drive has a disc that has a diameter of about 27 millimeters.

7. The hard disc drive of claim 1 wherein the monolithic body unitizes the stator, the actuator pivot and the base plate together.

8. The hard disc drive of claim 1 wherein the monolithic body unitizes the stator and the base plate together and the monolithic body unitizes the actuator pivot and base plate together.

9. The hard disc drive of claim 1 having a cover mounted to said base plate.

10. The hard disc drive of claim 9 wherein the cover is a printed circuit board.

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11. The hard disc drive of claim 9 wherein the cover is overmolded with a monolithic body of phase change material.

12. The hard disc drive of claim 1 wherein the spindle motor assembly is able to operate over 5000 rpm.

13. The hard disc drive of claim 1 wherein the spindle motor assembly is able to operate at at least 7500 rpm.

14. The hard disc drive of claim 1 wherein the spindle motor assembly is able to operate at at least 10,000 rpm.

15. The hard disc drive of claim 1 wherein the phase change material comprises a material that changes form a liquid to a solid due to a change in temperature.

16. The hard disc drive of claim 1 wherein the phase change material changes from a liquid to a solid due to a chemical reaction.

17. The hard disc drive of claim 1 wherein the phase change material comprises a thermosetting material or a thermoplastic material.

18. The hard disc drive of claim 1 wherein the phase change material is injection molded to form the monolithic body.

19. The hard disc drive of claim 1 wherein the phase change material includes ceramic particles.

20. The hard disc drive of claim 1 wherein the phase change material has a coefficient of linear thermal expansion of less than 2×10^{-5} in/in/°F throughout the range of 0-250°F.

21. The hard disc drive of claim 1 wherein the phase change material has a coefficient of linear thermal expansion of less than $1.5x10^{-5}$ in/in/°F throughout the range of 0-250°F.

22. The hard disc drive of claim 1 wherein the phase change material has a coefficient of linear thermal expansion of between about $0.8x10^{-5}$ in/in/°F and about $1.3x10^{-5}$ in/in/°F throughout the range of 0-250°F.

23. The hard disc drive of claim 1 wherein the base comprises steel, the hub comprising aluminum and phase change material has a coefficient of linear thermal expansion that is between the coefficient of linear thermal expansion of the steel and the coefficient of linear thermal expansion of the aluminum.

24. The hard disc drive of claim 1 wherein the phase change material has a thermal conductivity of at least 0.7 watts/meter°K at 23°C.

25. The hard disc drive of claim 1 wherein the phase change material has a dielectric strength of at least 250 volts/mil.

26. The hard disc drive of claim 1 wherein the phase change material has a coefficient of linear thermal expansion in the X, Y and Z directions, wherein the coefficient of linear thermal expansion is lowest in the X direction, and wherein the coefficient of linear thermal expansion in the Y and Z directions is no more than four times the coefficient of linear thermal expansion in the X direction.

27. A base for a miniature hard disc drive comprising:

a) a metal base plate; and

b) a monolithic body layer of phase change material on one or more surfaces of the metal base plate, wherein said monolithic body forms body features of the base.

28. The base of claim 27 wherein the body features comprise flanges, lips, grooves and connectors.

29. The base of claim 27 wherein the metal base plate comprises steel and the phase change material has a coefficient of linear thermal expansion that is between the coefficient of linear thermal expansion of the steel and the coefficient of linear thermal expansion of the aluminum.

30. The base of claim 27 formed from a metal strip having at least two base plates.

31. The metal strip of claim 30 wherein said metal strip contains apertures that allow it to be used as a carrier during the manufacturing process.

32. The method of claim 27 wherein the metal strip is fed continuously through an injection molding machine to sequentially injection mold the monolithic body on each base plate.

33. The hard disc drive manufactured with a base of claim 27 having a cover mounted to said base plate.

34. The hard disc drive of claim 33 wherein the cover is a printed circuit board.

35. The hard disc drive of claim 33 wherein the cover is overmolded with a monolithic body of phase change material.

36. A hard disc drive comprising the base of claim 27, an actuator assembly, and a spindle motor assembly.

37. A miniature hard disc drive comprising:

a) a metal base plate;

b) an actuator assembly wherein the actuator assembly comprises a plurality of bearings, a shaft, and a housing;

c) a spindle motor assembly comprising a stator with conductors, a shaft, a plurality of bearings, and a rotor; and

e) a monolithic body layer of phase change material unitizing said actuator assembly housing and said stator to the base plate.

38. The miniature hard disc drive of claim 37 wherein the monolithic body layer substantially encapsulates a top surface of the base plate, a top surface of the stator, and an external surface of the actuator assembly housing.

39. The miniature hard disc drive of claim 37 wherein the monolithic body has a thickness of about 0.2 millimeters.

40. The miniature hard disc drive of claim 37 wherein the monolithic body layer is thicker at an outer edge of the base plate.

41. A method for making a miniature hard disk drive comprising:

a) providing a stator having a plurality of poles with wire windings around said poles;

b) providing an actuator assembly housing;

c) providing a base plate;

d) substantially encapsulating the stator, the actuator assembly housing and the base plate with a phase change material to form a unitized body; and

f) forming a miniature hard disc drive from said unitized body.

42. The method of claim 41, wherein said encapsulation is performed by injection molding in an injection molding apparatus.

43. An electronic device having the miniaturized hard disc drive of claim 37.

44. An electronic device having the hard disc drive of claim 1.

45. An electronic device having a miniaturized hard disc drive made by the method of claim 41.

46. A method of manufacturing a miniature hard disc drive comprising:

a) providing a metal strip having at least two base plates;

b) placing a stator on a top surface of each of said base plates;

c) injection molding a monolithic body layer of phase change material unitizing said stator to the base plate;

d) forming a spindle motor around the stator; and

e) attaching an actuator assembly on the base plate.

47. The method of claim 46 wherein the metal strip is used as a carrier.

48. The method of claim 46 wherein the metal strip is fed continuously through an injection molding machine to sequentially injection mold the monolithic body on each base plate.

49. A method of manufacturing a miniature hard disc drive comprising:

a) providing a metal base plate;

b) placing a spindle motor assembly on a top surface of said base plate;

c) injection molding a monolithic body layer of phase change material to unitize said spindle motor assembly to the base plate; and

d) attaching an actuator assembly on the base plate.

50. The method of claim 49 wherein the base plate is part of a metal strip which comprises at least two base plates.

51. A method of manufacturing a miniature hard disc drive comprising:

a) providing a metal base plate;

b) placing an actuator assembly on a top surface of said base plate;

c) injection molding a monolithic body layer of phase change material unitizing said actuator assembly to the base plate; and

d) attaching a spindle motor assembly on the base plate.

52. The method of claim 51 wherein the base plate is part of a metal strip which comprises at least two base plates.

53. A method of manufacturing a hard disc drive comprising:

a) providing a metal strip which comprises at least one base plate and one cover;

b) providing a stator assembly;

c) providing an actuator assembly;

d) providing a mold having two cavities;

e) placing the metal strip into the mold; and

f) injection molding a phase change material to form a monolithic body on the base plate and cover.

54. The method of claim 53 wherein the injection molding step further comprises:

a) placing the stator assembly on a top surface of the base plate; and

b) encapsulating said spindle motor assembly with a phase change material unitizing the spindle motor assembly with the base plate.

55. The method of claim 53 wherein the injection molding step further comprises:

a) placing the actuator assembly on a top surface of the base plate; and

b) encapsulating said actuator assembly with a phase change material unitizing the actuator assembly with the base plate.

56. The method of claim 53 wherein the metal strip is continuously fed through the injection molding machine to sequentially injection mold the monolithic body onto each base plate and cover.

57. The method of claim 53 wherein the metal strip comprises a predetermined number of base plates and covers.

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58. The method of claim 53 wherein the monolithic body forms body structures of the base and cover.

59. The method of claim 58 wherein the body structures comprise flanges, lips, grooves and connectors.

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